tyco Electronics

M/A-COM

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March 20, 2004

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington, DC 20554

Re: Ex Parte Notice, Docket WT 99-87

Dear Ms. Dortch:

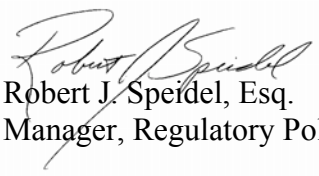
On March 19, 2004 the undersigned sent the attached presentation to John B. Muleta, Chief of the Wireless Telecommunications Bureau.

The purpose of the attached presentation is to answer a question posed by Mr. Muleta during our discussion on February 4, 2004 regarding the 2nd Report and Order in Docket No. WT 99-87, *Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended* including the M/A-COM suggestion for revised VHF and UHF band structures.

I also told Mr. Muleta that myself and Dr. Charles L. Jackson who computed the results depicted in the attached presentation would be happy to meet with Mr. Muleta if he feels it is appropriate. Should such a meeting be scheduled and occur, I will file the additional appropriate *ex parte* notice(s).

If there are any questions, please do not hesitate to contact me. I can be reached at (434) 455-9465.

Sincerely,



Robert J. Speidel, Esq.
Manager, Regulatory Policy

Attachment
cc: WT 99-87 (electronic filing only)
John B. Muleta, Attachment (electronic copy only)

# Economic Analysis

## Current FCC VHF/UHF structure
## vs.
## M/A-COM Suggested VHF/UHF Structure

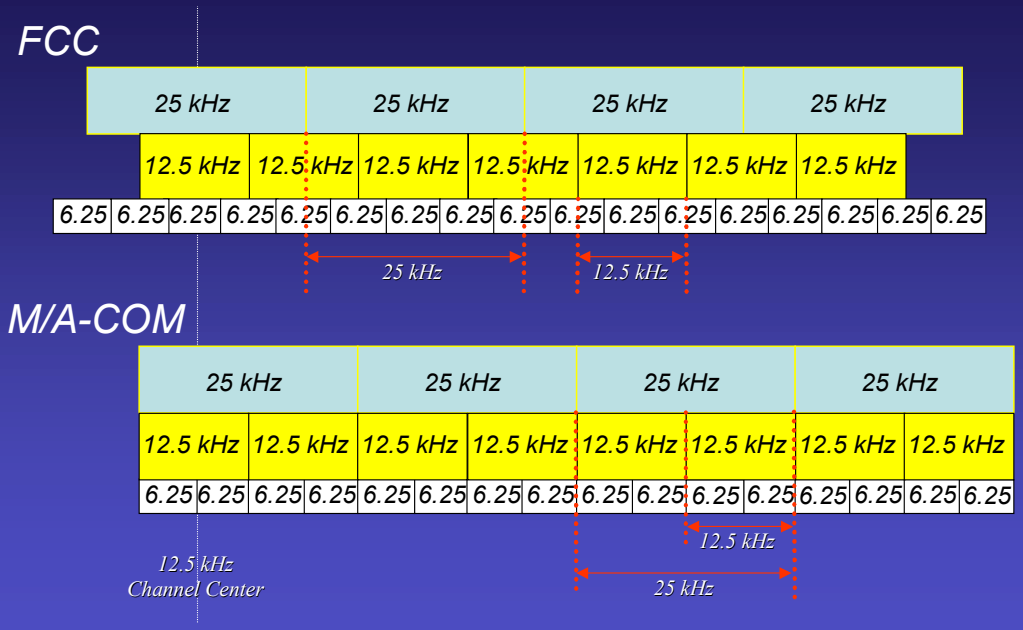
# Assumptions - M/A-COM Structure

- No difference in 12.5 kHz channel centers
  - Current FCC Structure and suggested M/A-COM structure utilize same 12.5 kHz channel centers
- 25 kHz channels in M/A-COM structure result from combining two adjacent 12.5 kHz channels
  - During migration period changes to new spectrally efficient 25 kHz systems will utilize new 25 kHz channel centers.
- 2 complete 6.25 kHz channels result from split of one 12.5 kHz channel in M/A-COM structure

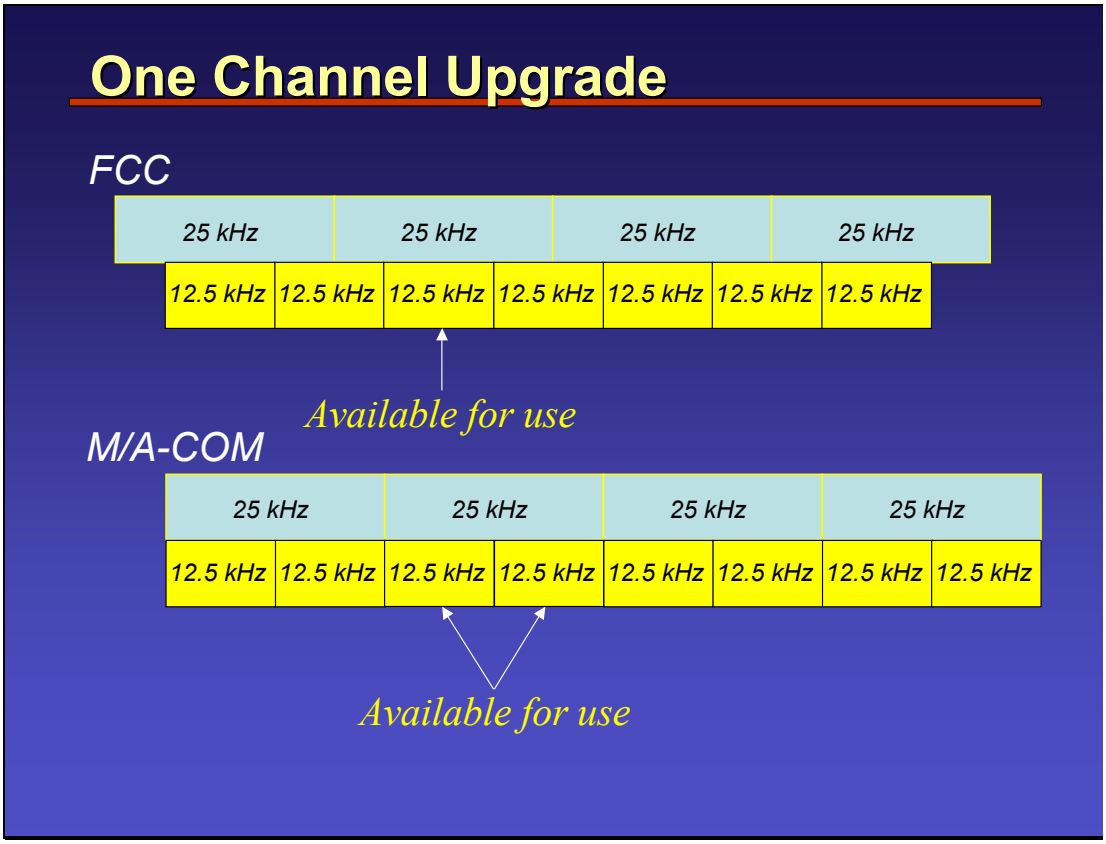
# Fundamental problem

- The current channel narrowband migration rules do not immediately free up spectrum.
- Operations at old frequencies transition to operation at narrower bandwidths.
- New channels were added at offsets to old frequencies.
  - Had some advantages with older FM systems
  - Does not free up new channels immediately
- These rules match the FCC's practice of many years.

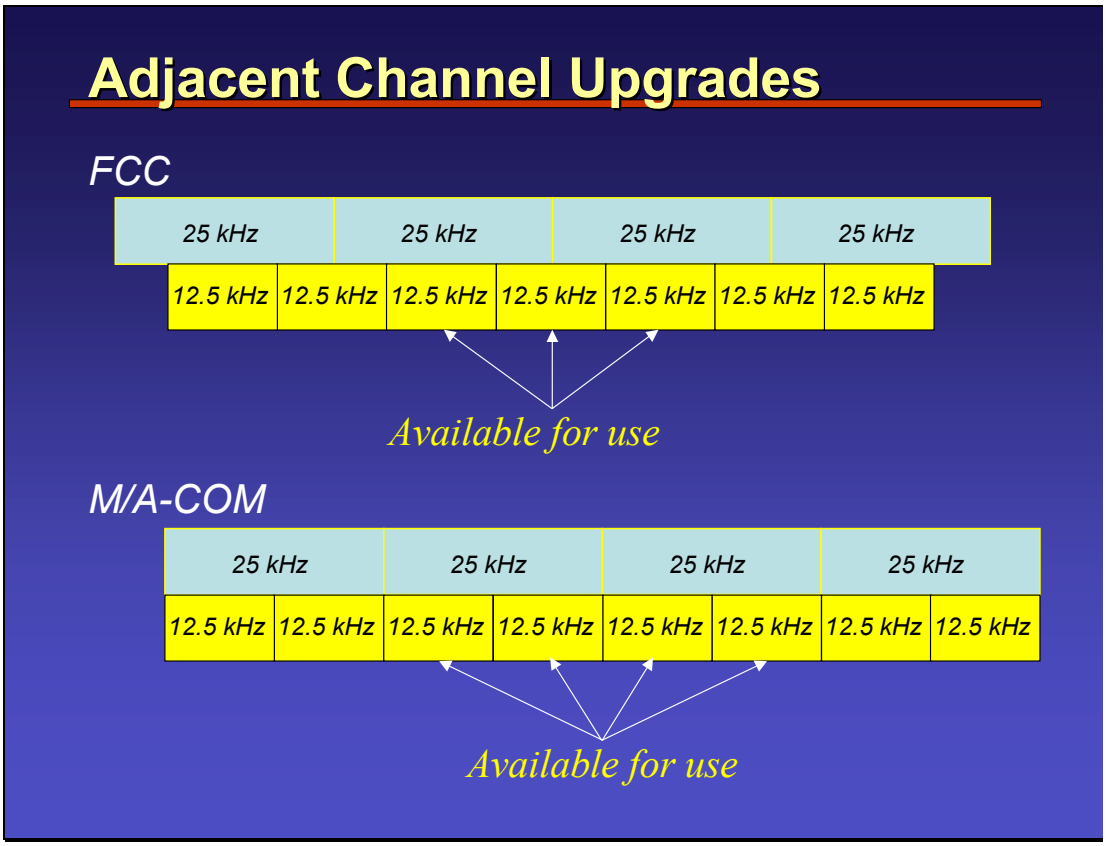
# FCC and M/A-COM Approaches



# One Channel Upgrade




# Adjacent Channel Upgrades



## Practical Implications

- Refarming was necessary because, in many urban regions of the country, channels were no longer available.
- The FCC's current band structure does not free up new channels until adjacent users upgrade.
- If a random 10% of the users upgrade, how many channels will be freed up?
  - FCC Rule: about 1% of the total new channels
  - M/A-COM: 10% of the total new channels.

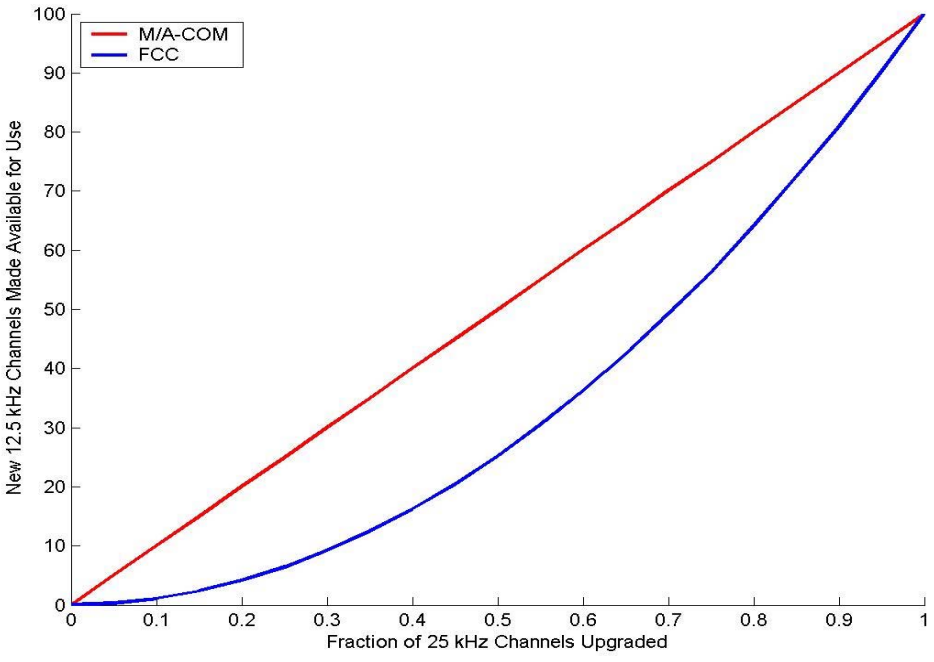
## Why This Big Difference?

- If only a few users have upgraded to 12.5 kHz systems, it is unlikely that two users with adjacent channels have upgraded.
  - Adjacent conversions are necessary under the FCC rules to free up a frequency.
  - Under the M/A-COM proposal each user that upgrades frees up a frequency.

## The Simulation Model

- Developed in MATLAB 6.5
- Considered 100 adjacent 25 kHz channels.
- Generated a random pattern of upgrades in which each user upgraded with probability *p*.
- The program varied *p* from 0.0 to 1.0 in steps of 0.05 and recorded the number of 12.5 kHz channels made available by the upgrades.
- The previous step was repeated 5,000 times and the results averaged.
- The analysis did not take into account any differences between the plans at the band edges. (end effects)

## Simulation Results



## Discussion

- For all upgrade patterns the M/A-COM policy makes available more 12.5 kHz channels.
  - Exception 0% and 100% upgrades.
- No policy can outperform the M/A-COM rule.
  - It frees up a 12.5 kHz channel each time a user goes from 25 kHz to 12.5 kHz.
- The same analysis applies to the 12.5 to 6.25 conversion as well.

## Analysis of Net Present Value

- Consider upgrades over a ten year period.
- Assume that a random 10% of the original users upgrade each year.
- Simulation result shown before shows how many more channels are available each year under the M/A-COM policy.
  - None at time 0 and after 10 years.
  - A full 25% extra channels at year 5.

## Discounted Channel-Years

- Can calculate a net present value of these added channels by discounting future channels back to the present.
  - i.e., a channel *n* years from now is worth only $D^n$ where D is the discount factor (1 minus the interest rate).
- Assume 0% discount rate.
  - NPV FCC rule: 360 channel years
  - NPV M/A-COM policy: 525 channel years
    - (The M/A-COM result is not exactly 500 because simulation was done assuming 6 month intervals)

## NPV Advantage of 60%

- Assume 10% discount rate.
  - NPV FCC rule: 164 channel years
  - NPV M/A-COM policy: 264 channel years
- M/A-COM policy generates 60% larger benefits over the 10-year transition period.
- This is a substantial difference in favor of the M/A-COM policy!

## Advantage at 20% Discount Rate

- Assume 20% discount rate.
  - NPV FCC rule: 73 channel years
  - NPV M/A-COM policy: 134 channel years
- M/A-COM policy generates 84% larger benefits.

## NPV: Summing UP

- NPV advantage of M/A-COM rule
  - Uniform upgrading over 10 years
  - Because the M/A-COM rule makes channels available earlier, the higher the discount rate the greater its NPV advantage.

| Interest Rate | Percent Advantage |
|---|---|
| 0% | 46% |
| 10% | 60% |
| 20% | 84% |

## Conclusions

- M/A-COM's proposed rule frees up spectrum faster than the current rule.
- Equivalent to about 10% more spectrum.

  (10% discount rate, uniform transition over 10 years)
- M/A-COM rule is much faster in the early years.
- Advantage is greater if upgrading takes more than 10 years or if upgrading occurs mostly in the out years.
- Analysis of the 12.5 to 6.25 transition is the same—with the same benefit ratio.

## Caveats

- One dimensional model

  Reasonable: This represents the situation in a single urban area. These are the areas of greatest frequency congestion and greatest demand.

  Shortcoming: This analysis does not take into account possibility of adding offset channels at some distance from the urban area.
- Did not model simultaneous 25? 12.5 and 12.5? 6.25 transitions.
  - There is no reason to expect different results when considering a mix of these two transitions.